

I.T.S Engineering College, Greater Noida

Department of Electronics and Communication Engineering

| S.No | Subject Code/Subject Name | Course Outcomes |
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| 1 | KNC301:Computer System Security | CO1 Discover software bugs that pose cyber security threats and to explain how to fix the bugs to mitigate such threats CO2 Diagnose cyber attack scenarios to web browsers and web servers and to explain how to mitigate such threats CO3 Detect and explain mobile software bugs posing cyber security threats, explain and recreate exploits, and to explain mitigation techniques. CO4 Articulate the urgent need for cyber security in critical computer systems, networks, and world wide web, and to explain various threat scenarios CO5 Analyze the well known cyber attack incidents, explain the attack scenarios, and explain mitigation techniques. |
| 2 | KEC301:ELECTRONIC DEVICES | CO1 Understand the principles of semiconductor devices. CO2 Elaborate and utilize the mathematical models of semiconductor junctions. CO3 Articulate carrier transport in semiconductors and design resistors. CO4 Utilize the mathematical models of MOS transistors for circuits and systems. CO5 Analyze and find application of special purpose diodes. |
| 3 | KEC302:DIGITAL SYSTEM DESIGN | CO1 Design and analyze combinational logic circuits. CO2 Compose and analyze modular combinational circuits with MUX / DEMUX, Decoder & Encoder. CO3 Create & Characterize synchronous sequential logic circuits. CO4 Analyze various logic families. CO5 Construct ADC and DAC and implement in amplifier, integrator, etc. |
| 4 | KEC-303:NETWORK ANALYSIS & SYNTHESIS | CO1 Understand basics electrical circuits with nodal and mesh analysis. CO2 Implementation electrical network theorems. CO3 Apply trigonometric and exponential Fourier Series CO4 Apply Laplace Transform for RLC Circuit. CO5 Implementation of frequency domain techniques. |
| 5 | KOE-035:Basics Data Structure and Algorithms | CO1 Analyze the time and space complexity of an algorithm CO2 Implement fundamental algorithms (including sorting algorithms, graph algorithms, and dynamic programming) CO3 Discuss various algorithm design techniques for developing algorithms CO4 Understand & discuss various searching, sorting and graph traversal algorithms CO5 Evaluate various operation on Queue , Priority Queue , D-Queue. |
| 6 | TECHNICAL COMMUNICATION | CO1 Students will be enabled to understand the nature and objective of Technical Communication relevant for the work place as Engineers. CO2 Students will utilize the technical writing for the purposes of Technical Communication and its exposure in various dimensions. CO3 Students would imbibe inputs by presentation skills to enhance confidence in face of diverse audience. CO4 Technical communication skills will create a vast know-how of the application of the learning to promote their technical competence. CO5 It would enable them to evaluate their efficacy as fluent & efficient communicators by learning the voice-dynamics. |
| 7 | ELECTRONICS DEVICES LAB | CO1 Understand working of basic electronics lab equipment. CO2 Clarify working of PN junction diode and its applications. CO3 Describe characteristics of Zener diode. CO4 Design a voltage regulator using Zener diode. CO5 Elaborate working of BJT, FET, MOSFET and apply the concept in designing of amplifiers |

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| 8 | DIGITAL SYSTEM DESIGN LAB | CO1 Design and analyze combinational logic circuits. CO2 Construct & audit modular combinational circuits with MUX/DEMUX, decoder, encoder. CO3 Create & characterize synchronous sequential logic circuits. CO4 Develop & build mini project using digital ICs. |
| 9 | NETWORK ANALYSIS & SYNTHESIS LAB | CO1 Understand basics of electrical circuits with nodal and mesh analysis. CO2 Implementation electrical network theorems. CO3 Analyze RLC circuits. CO4 Determine the stability of an electrical circuit. CO5 Design network filters. |
| 10 | MINI PROJECT | CO1 Identification of a project proposal which is relevant to the subject of engineering. CO2 Implement proposed project with estimated cost and time of completing the work. CO3 Demonstrate the project with its working. CO4 Demonstrate leadership with team and individual work whilst abiding by established norms of professional ethics. |
| 11 | PYTHON PROGRAMMING, | CO1 Read and write simple Python programs. CO2 Develop Python programs with conditionals and loops. CO3 Define Python functions and to use Python data structures — lists, tuples, dictionaries CO4 Prescribe input/output with files in Python CO5 Manage searching, sorting, and merging in Python |
| 12 | KAS402:MATHEMATICS-IV | CO1 Remember the concept of partial differential equation and to solve partial differential equations CO2 Analyze the concept of partial differential equations to evaluate the problems concerned with partial differential equations CO3 Understand the concept of correlation, moments, skewness and kurtosis and curve fitting CO4 Remember the concept of probability to evaluate probability Distributions. CO5 Apply the concept of hypothesis testing and statistical quality control to create control charts |
| 13 | KEC-401:COMMUNICATION ENGINEERING | CO1 Analyze and compare different analog modulation schemes for their efficiency and bandwidth. CO2 Analyze the behavior of a communication system in presence of noise. CO3 Demonstrate pulsed modulation system and analyze their system performance. CO4 Investigate various multiplexing techniques. CO5 Analyze different digital modulation schemes and compute the bit error performance. |
| 14 | KEC-402:ANALOG CIRCUITS | CO1 Understand the characteristics of diodes and transistors. CO2 Design and analyze various rectifier and amplifier circuits. CO3 Create sinusoidal and non-sinusoidal oscillators. CO4 Describe the functioning of OP-AMP and design OP-AMP based circuits. CO5 Construct LPF, HPF, BPF, BSF. |
| 15 | KEC-403:SIGNAL & SYSTEM | CO1 Analyze different types of signals. CO2 Characterize linear shift-invariant (LSI) systems. CO3 Represent continuous and discrete systems in time and frequency domain using Fourier series and transform. CO4 Diagnose discrete time signals in z-domain. CO5 Study sampling and reconstruction of a signal. |

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| 16 | KVE-401:UNIVERSAL HUMAN VALUES | <p>CO1 Understand the significance of value inputs in a classroom, distinguish between values and skills, understand the need, basic guidelines, content and process of value education, explore the meaning of happiness and prosperity and do a correct appraisal of the current scenario in the society</p> <p>CO2 Distinguish between the Self and the Body, understand the meaning of Harmony in the Self the Co-existence of Self and Body.</p> <p>CO3 Elaborate the value of harmonious relationship based on trust, respect and other naturally acceptable feelings in human-human relationships and explore their role in ensuring a harmonious society.</p> <p>CO4 Explain the harmony in nature and existence, and work out their mutually fulfilling participation in the nature</p> <p>CO5 Differentiate between ethical and unethical practices and start working out the strategy to actualize a harmonious environment wherever they work.</p> |
| 17 | COMMUNICATION ENGINEERING LAB | <p>CO1 Analyze and compare different analog modulation schemes for their modulation factor and power.</p> <p>CO2 Demonstrate pulse amplitude modulation.</p> <p>CO3 Analyze different digital modulation schemes and can compute the bit error performance.</p> <p>CO4 Study and simulate the Phase shift keying.</p> <p>CO5 Design a front end BPSK modulator and demodulator.</p> |
| 18 | ANALOG CIRCUIT LAB | <p>CO1 Understand the characteristics of transistors.</p> <p>CO2 Design and analyze various configurations of amplifier circuits.</p> <p>CO3 Create sinusoidal and non-sinusoidal oscillators.</p> <p>CO4 Elaborate the functioning of OP-AMP and design OP-AMP based circuits.</p> <p>CO5 Construct ADC and DAC.</p> |
| 19 | SIGNAL & SYSTEM LAB | <p>CO1 Understand the basics operation of MATLAB.</p> <p>CO2 Analysis the time domain and frequency domain signals.</p> <p>CO3 Implement the concept of Fourier series and Fourier transforms.</p> <p>CO4 Find the stability of system using pole-zero diagrams and bode diagram.</p> <p>CO5 Design frequency response of the system.</p> |
| 20 | INTEGRATED CIRCUITS, | <p>CO1 Explain complete internal analysis of Op-Amp 741-IC.</p> <p>CO2 Examine and design Op-Amp based circuits and basic components of ICs such as various types of filter.</p> <p>CO3 Implement the concept of Op-Amp to design Op-Amp based non-linear applications and wave-shaping circuits.</p> <p>CO4 Analyse and design basic digital IC circuits using CMOS technology.</p> <p>CO5 Describe the functioning of application specific ICs such as 555 timer,VCO IC 566 and PLL.</p> |
| 21 | KEC-502:MPMC, | <p>CO1 Demonstrate the basic architecture of 8085 and interfacing with memory and IO devices</p> <p>CO2 Illustrate the programming model of microprocessors & write program using 8085 microprocessor.</p> <p>CO3 Demonstrate the basics of 8086 Microprocessor and interface different external Peripheral Devices like timer, USART etc. with Microprocessor (8085/8086).</p> <p>CO4 Compare Microprocessors & Microcontrollers, and comprehend the architecture of 8051 microcontroller</p> <p>CO5 Illustrate the programming model of 8051 and implement them to design projects on real time problems.</p> |
| 22 | KEC-503:DIGITAL SIGNAL PROCESSING, | <p>CO1 Understand and realize different types of realizations of digital systems (IIR and FIR) and their utilities.</p> <p>CO2 Formulate the design parameters of analog IIR digital filters (Butterworth and Chebyshev filters) and various methods such as impulse invariant transformation and bilinear transformation of conversion of analog to digital filters</p> <p>CO3 Analyze different types of window functions used for the design of FIR filters.</p> <p>CO4 Describe the principle of discrete Fourier transform & its various properties and concept of circular and linear convolution.</p> <p>CO5 Apply the concept of decimation and interpolation in various practical applications.</p> |

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| 23 | KEC-051:COMPUTER ARCHITECTURE & ORGANIZATION, | <p>CO1 Discuss about the basic concepts of system design methodology and processor level design.</p> <p>CO2 Explain the basics of processor and basic formats of data representation.</p> <p>CO3 Demonstrate fixed and floating point arithmetic operations.</p> <p>CO4 Describe the basic concepts of control design and pipeline performance.</p> <p>CO5 Explain the architecture and functionality of memory and system.</p> |
| 24 | KNC501:CONSTITUTION OF INDIA, LAW AND ENGINEERING, | <p>CO1 Identify and explore the basic features and modalities about Indian constitution</p> <p>CO2 Differentiate and relate the functioning of Indian parliamentary system at the center and state level.</p> <p>CO3 Differentiate different aspects of Indian Legal System and its related bodies.</p> <p>CO4 Discover and apply different laws and regulations related to engineering practices</p> <p>CO5 Correlate role of engineers with different organizations and governance models.</p> |
| 25 | KEC-057:ELECTRONIC MEASUREMENTS & INSTRUMENTATION, | <p>CO1 Evaluate errors in measurement as well as identify and use different types of instruments for the measurement of voltage, current, power and energy</p> <p>CO2 Demonstrate the working of Electronics and Digital Instruments like DVM DMM.</p> <p>CO3 Display the knowledge of measurement of electrical quantities resistance, inductance and capacitance with the help of bridges.</p> <p>CO4 Manifest the working of electronic instruments like voltmeter, multi-meter, frequency meter and CRO.</p> <p>CO5 Display the knowledge of transducers and their application in different quantities measurements.</p> |
| 26 | KEC-551:INTEGRATED CIRCUITS LAB, | <p>CO1 Design different non-linear applications of operational amplifiers such as log, antilog amplifiers and voltage comparators.</p> <p>CO2 Explain and design different linear applications of operational amplifiers such as filters.</p> <p>CO3 Demonstrate the function of waveforms generator using op-Amp.</p> <p>CO4 Construct multivibrator and oscillator circuits using IC555 and IC566 and perform measurements of frequency and time.</p> <p>CO5 Design and practically demonstrate the applications based on IC555 and IC566.</p> |
| 27 | MPMC LAB, | <p>CO1 Use techniques, skills, modern engineering tools, instrumentation and software/hardware appropriately to list and demonstrate arithmetic and logical operations on 8 bit data using microprocessor 8085</p> <p>CO2 Examine 8085 & 8086 microprocessor and its interfacing with peripheral devices</p> <p>CO3 State various conversion techniques using 8085 & 8086 and generate waveforms using 8085.</p> <p>CO4 Implement programming concept of 8051 Microcontroller</p> <p>CO5 Design concepts to Interface peripheral devices with Microcontroller so as to design Microcontroller based projects.</p> |
| 28 | DIGITAL SIGNAL PROCESSING LAB, | <p>CO1 Learn to apply the linear systems approach to signal processing problems using MATLAB and Code Composer Studio.</p> <p>CO2 Generate and analyze various types of signals and operations used in the signal processing.</p> <p>CO3 Perform frequency domain analysis of discrete time systems using N- point DFT and FFT.</p> <p>CO4 Design and evaluate the performance of FIR and IIR filters using window techniques and Butterworth approximation, respectively.</p> <p>CO5 Understand the concept of circular convolution and linear convolution.</p> |
| 29 | MINI PROJECT, | <p>CO1 Identification of a project proposal which is relevant to the subject of engineering.</p> <p>CO2 Implement proposed project with estimated cost and time of completing the work.</p> <p>CO3 Demonstrate the project with its working.</p> <p>CO4 Demonstrate leadership with team and individual work whilst abiding by established norms of professional ethics.</p> |

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| 30 | KEC-601:DIGITAL COMMUNICATION, | <p>CO1 Apply the concept of probability, random processes, and power spectral density. Understand correlation.</p> <p>CO2 Describe the line coding, pulse shaping scrambling, digital receiver, and eye diagram, Compare the different modulation techniques</p> <p>CO3 Calculate the error probability of optimum receivers and analyze the performance of digital communication system.</p> <p>CO4 Analyze the digital communication system with spread spectrum modulation</p> <p>CO5 Compute measure of information and capacity for different channels .To obtain error correcting codes, linear block codes and code Tree ,Trellis and Viterbi algorithm</p> |
| 31 | KEC-602:CONTROL SYSTEM, | <p>CO1 Analyze the input- output relationship of the system, comparison between open loop and closed loop system and understand basic elements of Block Diagram, Multiple input-Multiple output system</p> <p>CO2 Understand the concept of state space analysis and its applications in modeling of physical system.</p> <p>CO3 Evaluate Standard Test input signals, time response of first order and second order control system, effects of feedback on time constant of a control system, steady state error, Effect of parameters variation in open loop and close loop system.</p> <p>CO4 Describe the concept of stability, conditions for stability the Routh Hurwitz Criterion and application. Design Aspects of root locus</p> <p>CO5 Apply the concept of frequency response correlation between time and frequency domain specifications for a second order system and to sketch the Bode Plot, Nyquist Plot and their applications.</p> |
| 32 | KEC603:ANTENNA AND WAVE PROPAGATION, | <p>CO1 Identify different coordinate systems and their applications in electromagnetic field theory to establish a relation between any two systems using the vector calculus</p> <p>CO2 Explain the concept of static electric field, current and properties of conductors</p> <p>CO3 Demonstrate the knowledge of antenna fundamentals and radiation mechanism of the antenna</p> <p>CO4 Analyze and design different types of basic antennas</p> <p>CO5 Express the basic concepts of ground, space, sky wave propagation mechanism.</p> |
| 33 | KOE-064:OBJECT ORIENTED PROGRAMMING | <p>CO1 Understand the Basic concept of Object Orientation, object identity and Encapsulation</p> <p>CO2 Understand the Basic concept of Basic Structural Modeling</p> <p>CO3 Know the knowledge of Object oriented design, Object design.</p> <p>CO4 Know the knowledge of C++ Basics</p> <p>CO5 Understand the Basics of object and class in C++.</p> |
| 34 | KEC-063:DATA COMMUNICATION NETWORK, | <p>CO1 Identify the issues and challenges in the architecture of a network. Understand the ISO/OSI seven layers in a network</p> <p>CO2 Understand the Physical and Data link layers in a network.</p> <p>CO3 Understand the various multiple access layer, IEEE and ethernet use in networking.</p> <p>CO4 Understand network layer, IP versions and connecting devices in network.</p> <p>CO5 Understand transport and application layer and its various issues.</p> |
| 35 | KNC602:INDIAN TRADITION, CULTURE AND SOCIETY | <p>CO1 Identify and explore the basic principles of thought process, basic reasoning and inference to identify the roots and details of some of the contemporary issues faced by our nation.</p> <p>CO2 Ability to understand the importance of our surroundings and encourage the students to contribute towards sustainable development</p> <p>CO3 Connect up students towards issues related to 'Indian' culture, tradition and its composite character</p> <p>CO4 Discover and aware of holistic life styles of Yogic-science and wisdom in modern society with technological advancements and societal disruptions.</p> <p>CO5 Explain the basics of Indian Traditional knowledge modern scientific perspective.</p> |

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| 36 | KEC-651:DIGITAL COMMUNICATION LAB | <p>CO1 Demonstrate and plot a waveform of Amplitude shift keying, Frequency shift keying and Phase shift keying modulator and demodulator.</p> <p>CO2 Implement the pulse data coding techniques for NRZ and RZ format and Manchester coding and decoding.</p> <p>CO3 Construct a triangular wave and Square wave with the help of Fundamental Frequency and its Harmonic component</p> <p>CO4 Calculate the single bit error detection and correction using Hamming code.</p> <p>CO5 Simulate Differential Phase Shift Keying, phase shift keying, Quadrature phase shift keying techniques using MATLAB software.</p> |
| 37 | KEC-652:CONTROL SYSTEM LAB, | <p>CO1 Write code on Matlab and applications of Matlab</p> <p>CO2 Implement mathematical modeling of systems</p> <p>CO3 Analyze and design the systems based on time domain specifications</p> <p>CO4 Design the systems based on frequency domain specifications</p> <p>CO5 Plot various plots like bode plot, nyquist plot and root locus used for analysis and design of system.</p> |
| 38 | KEC-653B:CAD OF ELECTRONICS, | <p>CO1 Conduct transient and DC analysis of BJT inverter using step input</p> <p>CO2 Illustrate transient and DC analysis of NMOS inverter using different input signals.</p> <p>CO3 Implement and analyse the CMOS inverter</p> <p>CO4 Design and implement different gates with the help of MOS inverter.</p> <p>CO5 Implement Differential Amplifier, Common Source and Source Follower amplifiers.</p> |
| 39 | KHU702:Project Management and Entrepreneurship | <p>CO1 To understand the Entrepreneurial Development Programmes</p> <p>CO2 To generate entrepreneurial Idea and to identifying Business Opportunities</p> <p>CO3 Able to prepare and analyse real time project feasibility report containing Technical appraisal.</p> <p>CO4 Able to estimate project cost & working capital requirements.</p> <p>CO5 To create the social entrepreneurship opportunities</p> |
| 40 | KEC074:Microwave & Radar Engineering | <p>CO1 Analyze various parameters and characteristics of the transmission line and waveguide and also use of wave guide component as per applications.</p> <p>CO2 Describe, analyze and design simple microwave circuits and devices e g couplers, Attenuators, Phase Shifter and Isolators</p> <p>CO3 Analyze the difference between the conventional tubes and the microwave tubes for the transmission of the EM waves.</p> <p>CO4 Acquire knowledge about the handling and measurement of microwave equipment</p> <p>CO5 Differentiate different Radars, find applications and use of its supporting systems</p> |
| 41 | KEC076:Wireless & Mobile Communication | <p>CO1 Understand the fundamentals of wireless communication.</p> <p>CO2 Understand the concept of spread spectrum and diversity in cellular communication.</p> <p>CO3 Understand the concept of Equalization and Multiple Access techniques in wireless communication.</p> <p>CO4 Outline of GSM mobile communication standard, CDMA, IMT-2000, LTE, its architecture, logical channels, advantages and limitations.</p> <p>CO5 Understand various wireless networks like adhoc, WI-FI, Ultra-wideband, mobile data networks, 4G, 5G and NGN.</p> |
| 42 | KOE074:Renewable Energy Resources | <p>CO1 To study and understand various non-conventional energy resources and solar cell.</p> <p>CO2 To implement solar thermal power plant.</p> <p>CO3 To apply the Geothermal resources and MHD for energy production.</p> <p>CO4 To implement thermoelectrical, thermoionic and wind power energy conversion system.</p> <p>CO5 To demonstrate Biomass, ocean thermal energy, wave and tidal energy generation.</p> |

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| 43 | KEC751D:MICROWAVE AND RADAR ENG | <p>CO1 Describe working on microwave testing bench</p> <p>CO2 Practically demonstrate the Characteristics of Reflex klystron using Microwave bench setup</p> <p>CO3 Demonstrate the performance of the Gunn diode using Microwave bench setup.</p> <p>CO4 Perform measurement of Frequency, attenuation, VSWR, Impedance of microwave passive device using Klystron Bench Setup.</p> <p>CO5 Interpret the basics of Smith chart for solution of transmission line problems and impedance matching</p> |
| 44 | KEC-753:PROJECT-I | <p>CO1 Identification of a project proposal which is relevant to the subject of engineering and engage in state-of-art literature review to formulate an Engineering problem.</p> <p>CO2 Design and implement proposed project methodology with estimated cost of completing the work.</p> <p>CO3 Demonstrate leadership with team and individual work whilst abiding by established norms of Professional ethics.</p> <p>CO4 Effective Communication skills (Written, oral and presentation) to assimilate their project work.</p> |
| 45 | KEC-753:INDUSTRIAL TRAINING AND VIVA | <p>CO-1 Understand the organisational structure of the industry and recognise the need of skill development.</p> <p>CO-2 Understand how to write a successful training report</p> <p>CO-3 Present your Skills in an effective manner with ethics.</p> <p>CO-4 Competence of acquiring and applying fundamental engineering principles</p> <p>CO5 Presentation on the learning and organisation. Queries handling capacity.</p> |
| 46 | KHU 801:HSMC 1 Rural Development: Administration & Planning (RD) | <p>CO1 Students can understand the definitions, concepts and components of Rural Development</p> <p>CO2 Students will know the importance, structure, significance, resources of Indian rural economy.</p> <p>CO3 Students will have a clear idea about the area development programmes and its impact.</p> <p>CO4 Students will be able to acquire knowledge about rural entrepreneurship.</p> <p>CO5 Students will be able to understand about the using of different methods for human resource planning</p> |
| 47 | KOE 094:Open ElectiveIV: Digital & Social Media Marketing (DSMM) | <p>CO1 A comprehensive understanding of digital technologies, changing marketing strategies and tactics across different industries</p> <p>CO2 To understand social media marketing and its marketing strategies.</p> <p>CO3 To understand the relationship between content branding and its impact on digital channels.</p> <p>CO4 To design an organization for digital success.</p> <p>CO5 To implement digital innovation and current trends in digital marketing.</p> |
| 48 | KOE-083:ENTREPRENEURSHIP DEVELOPMENT | <p>CO1 Analyze environmental setup relating to small industry and business.</p> <p>CO2 Identification of the project with various parameters.</p> <p>CO3 Preparation, planning and calculation of financial budget of industries.</p> <p>CO4 To understand project planning and control.</p> <p>CO5 To understand taxes, law and order for entrepreneur.</p> |
| 49 | KEC-851:PROJECT-II | <p>CO1 Analyse and interpret the results of experiments conducted on designed solution(s) for the identified engineering problem.</p> <p>CO2 Demonstrate a working model, prototype, proof of concept or technical innovation through effective oral communication.</p> <p>CO3 Independently engage in study of literature and assimilate a state of art literature review to formulate an Engineering problem.</p> <p>CO4 Presentation and Communication of created work effectively in context of societal, environmental and industrial need.</p> <p>CO5 Present a written record of the work in the form of a project report, poster, conference or research paper.</p> <p>CO6 Demonstrate team work, leadership and mentor-ship whilst abiding by established norms of professional ethics.</p> |